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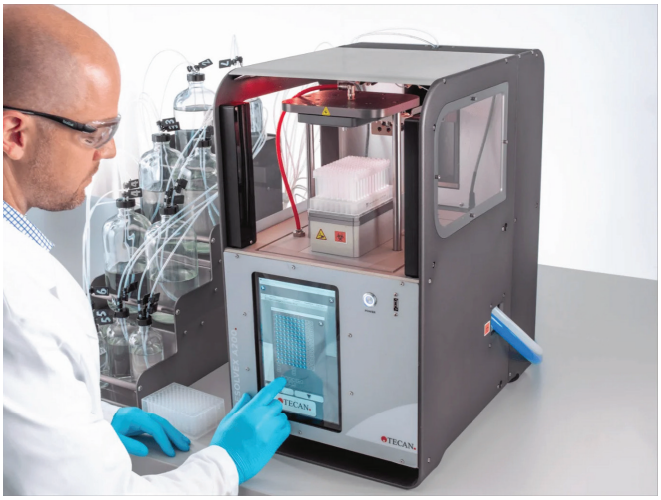
AUTOMATED DRUG EXTRACTION REDUCES SOLVENT USE, SAVES TIME AND IMPROVES EFFICIENCY.

Tecan Journal Article.

TECAN.

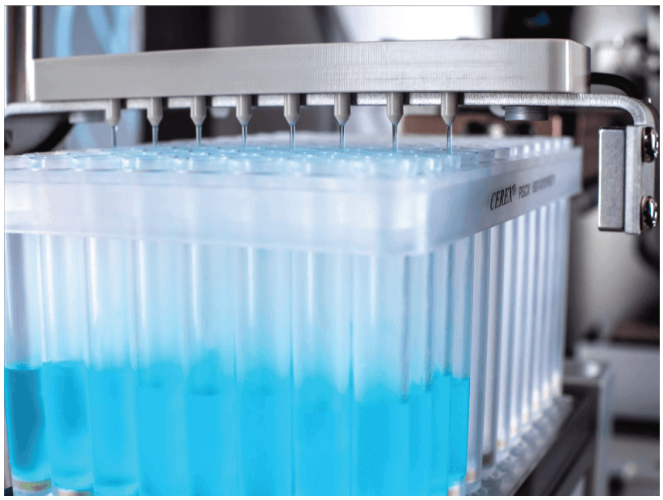
Sample preparation is a critical step for the analysis of drugs in urine, providing a purified, concentrated extract for downstream investigations. Medical diagnostics company SYNLAB has extended its capabilities in this area by using automated solid phase extraction (SPE) alongside conventional liquid-liquid extraction techniques to free up staff time and increase sample capacity.

SYNLAB is a leading global provider of medical diagnostic services, with over 450 laboratories in more than 30 countries spread across four continents. The company's toxicology and drug analysis laboratory in Hamburg, Germany, receives samples from doctors in private practices and hospitals who are overseeing addiction programs or psychiatric departments. Simon Bremicker, Technical Head of Toxicology and Drug Analysis at SYNLAB Hamburg, explained the laboratory's approach to testing for drugs of abuse and prescribed medications: "We focus on the analysis of drugs in urine, as concentrations are higher than in blood and the detection window longer. Sample volumes are also larger. Typically, we look for benzodiazepines, opiates, cocaine, tetrahydrocannabinol, amphetamines and barbiturates, as well as substitutes for drugs of abuse – such as methadone and buprenorphine – which are used when treating opioid addiction. Sample preparation is an important stage of the analytical process. We pre-screen samples on turbidimetry instruments, which run relatively automatically and provide same day results, then we perform confirmatory analysis by GC-MS and HPLC. The latter techniques require overnight hydrolysis, followed by further sample preparation, and this has historically been performed manually."



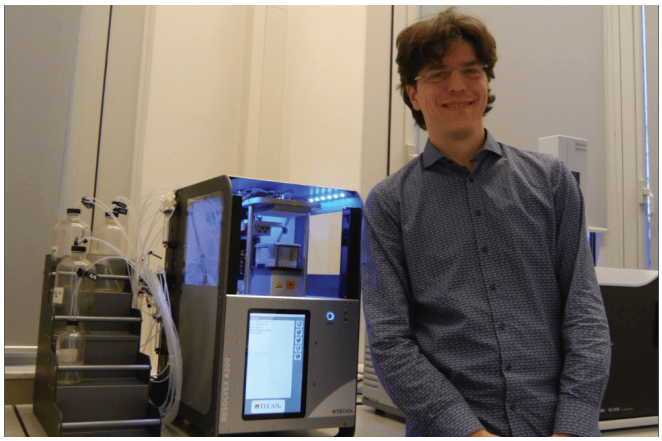
"Previously, we prepared chromatography samples using liquid-liquid extraction," Simon continued. "This is a time-consuming process, and is also a potential source of errors, as the formation of emulsions can make it difficult to separate the layers accurately. We therefore wanted to move away from this technique, and approached Tecan for an alternative workflow. This lead to us evaluating the Resolvex® A200 automated positive pressure processor with Cerex® and Narrow Bore Extraction™ (NBE) SPE columns. NBE Columns™ proved the most efficient for our workflow here in Hamburg, offering advantages over other standard column types. In standard solid phase extraction, analytes bind to a sorbent in the column, and unwanted components are washed through to waste. A small volume of solvent is then used to elute the analytes, which are both purified and more concentrated. NBE Columns feature an additional upper chamber, separated from the sorbent bed by an air lock, which can be used as a reaction vessel. This has the advantage of allowing us to perform overnight hydrolysis directly in the upper chamber, ready for extraction on the Resolvex A200 the following day. In the past, we sometimes had difficulties obtaining samples with sufficient volume for analysis, but the automated SPE workflow requires much smaller sample volumes, so we get accurate results even if we receive very little urine to analyze."

Automation offers many benefits for both laboratories and staff. It can reduce the number of transfer steps – and therefore the amount of plastic labware consumed – as well as the volumes of solvents and buffers used during the process, making the workflow more environmentally friendly. Analysts also benefit from having less contact with organic solvents. Simon described the benefits for his lab: "Automation saves us a lot of sample preparation time. When we did everything manually, it took one person over four hours to process 96 samples, including the centrifugation steps. The Resolvex A200 can process an entire 96-well plate in around 25 to 35 minutes, and be set up ready for the next run in about an hour in total – around a quarter of the time it takes to prepare the samples entirely manually. This frees up several hours of staff time for other tasks – which more than offsets the extra cost of consumables compared to our previous method – and gives us additional sample capacity if we need it. We use less than half the sample material required for manual processing, and the reproducibility and sensitivity have improved significantly too."



"We chose Tecan because of past experience with the company, and in-house evaluation of the Resolvex A200 and NBE Columns showed us what a difference automating our workflow could make. With the Resolvex A200, up to 96 samples are processed in parallel, and everything is ready at the same time; we can just set up the analytical instrument and walk away. This is preferable to sequential processing, where you must return to the instrument whenever another sample is ready to run, or else integrate an extraction platform with each analytical system."

"Implementation of the automated workflow went very smoothly. We had somebody from Tecan on site to help with method set-up during the initial evaluation, and we had more or less finalized our workflow by the end of the test phase. We've had our own instrument for almost a year now, and delivery was on time and trouble-free. Tecan set the system up for us, and it was ready to run the same day. It is very easy and intuitive to use, and support is always available if we need it. I think automation will continue to be important in the future, and I would be happy to work with Tecan again," Simon concluded.



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